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AUTHOR Hoversten, Gloria H.
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ABSTRACT

The Test of Auditory Comprehension (TAC), one component of the Auditory Skills Instructional Planning System, is a comprehensive test instrument designed for individual use with hearing impaired pupils, four through twelve years of age, for assessing receptive auditory functioning. Included in the TAC are ten discrete subtests measuring auditory abilities in three major areas: discrimination, memory sequencing, and figure-ground. TAC reliability was derived from the results of 82 hearing impaired pupils who were retested with the TAC within a two -to three-week period after initial testing; a reliability coefficient of .98 was obtained. In addition, variability was studied with 60 pupils, and no significant differences among examiners were found. TAC validity was obtained from the results of 750 hearing impaired pupils, from 29 schools and districts across the country. Results of data analysis, as well as evaluations of the TAC by participating audiclogists, demonstrated its validity. Normative data were compiled for this sample, grouped by age and degree of hearing loss. (Author/BW)

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Test of Auditory Comprehension (TAC)
for Hearing Impaired Pupils --
Reliability and Validity Study

Jane L. Trammell
Project Manager

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Susan L. Owens
Project Audiologist

Gloria H. Hoversten
Project Director

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Angeles County Superintendent of Schools

Audiologic Services
Division of Special Education
Office of the Los Angeles County
Superintendent of Schools

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FOREWORD

The study reported here was part of a program of research in Special Education in the Audiologic Services, Division of Special Education, Office of the Los Angeles County Superintendent of Schools.

The study was carried out during the academic year 1976-77 under the auspices of the Special Education Research Program, supported by Grant No. 76-32-D between the State Department of Education and the Office of the Los Angeles County Superintendent of Schools.

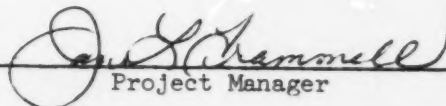
The full report is reproduced here in this form for distribution as a technical report under the grant, and in order to make complete findings available for others engaged in this research area. Results of this study are the sole responsibility of the investigators. Official endorsement of the California State Department of Education or the Office of the Los Angeles County Superintendent of Schools is not implied.

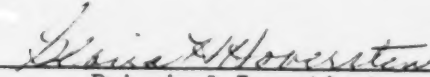
The investigators of this study wish to thank all of the participating schools and districts, audiologists who administered the TAC, and administrators who cooperated with us and supported the TAC standardization study. A list of participants, sites and number of pupils tested is presented in Appendix A.

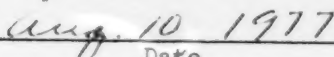
The project staff would also like to acknowledge the in-kind contributions of the Office of the Los Angeles County Superintendent of Schools, and in particular, the following persons who gave of their time, inspiration, expertise and effort:

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Project Manager


Principal Investigator


Date

ABSTRACT

The Test of Auditory Comprehension (TAC) was developed in response to numerous requests of audiologists, educators of the deaf, and educational placement teams for a single, comprehensive test instrument to evaluate hearing impaired pupils. To date, tests of the hearing impaired pupil's utilization of residual hearing have not measured directly the auditory processing of connected language, have not been appropriate for a broad age range, and could not be used with pupils with limited language competency.

The TAC, one component of the Auditory Skills Instructional Planning System, is a comprehensive test instrument designed for individual use with hearing impaired pupils, four through twelve years of age, for assessing receptive auditory functioning. Included in the TAC are ten discrete subtests measuring auditory abilities in three major areas: discrimination, memory sequencing, and figure-ground. Pilot tests and preliminary field test results verified the hierarchical subtest structure and face validity of the TAC.

TAC reliability was derived from results of 82 hearing impaired pupils who were retested with the TAC within a 2-3 week period after initial testing. A reliability coefficient of .98 was obtained for the TAC overall, with individual subtest reliability ranging from .66 to .92. These results indicated the TAC is reliable (consistent in its repeated measurement) and can be used as a measure of progress.

Additionally, variability among examiners was studied with 60 pupils. The project audiologist tested all pupils initially and retested one-half of the population. Two additional audiologists each retested one-fourth. Analysis of variance measures were applied to the pre/post results, indicating no significant differences among examiners.

TAC validity was obtained on results of 750 hearing impaired pupils, from 29 schools and districts across the country. Pupils were from 4-12 years of age, with hearing losses from moderate through profound, representing a variety of educational settings. Results of data analysis, as well as evaluations of the TAC by participating audiologists, showed that the TAC is an effective assessment tool, does differentiate levels of auditory functioning, and is appropriate for the population for which it was designed.

Normative data has been compiled for the 750 pupils grouped according to age (4-6 years, 7-9 years, and 10-12 years) and degree of loss (moderate, 41-55dB; moderate/severe 56-70dB; severe, 71-90dB; and profound, 91dB and greater). Mean TAC scores, ranges, and number of subtests passed were computed for each cell of the age and degree of loss matrix across a variety of factors, including class setting, sex, ethnicity, mode of communication, and other environmental and educational variables affecting the acquisition of auditory skills.

In summary, it has been shown that the Test of Auditory Comprehension is a reliable and valid instrument for assessing auditory functioning in the general hearing impaired pupil population. The TAC provides: (1) the audiologist with a valuable diagnostic/prescriptive tool, (2) the teacher of the hearing impaired with a practical guide for classroom planning and selection of auditory skill objectives, and (3) educational placement teams with additional information -- not previously available -- upon which to base educational placement decisions.

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HISTORICAL OVERVIEW

The Test of Auditory Comprehension (TAC) is an evaluative instrument designed for individual use with hearing impaired pupils, ages four through twelve years, for assessing receptive auditory functioning. The TAC was developed in response to numerous requests of audiologists, educators of the deaf, and educational placement teams for a single, comprehensive auditory skills assessment tool to evaluate hearing impaired/deaf pupils. The lack of valid and reliable criteria for differentiating levels of auditory functioning contributes to difficulty in predicting successful placement of the hearing impaired pupil in regular classes, planning appropriate sequence of auditory skill objectives, and determining progress in the acquisition of auditory skills.

"In-depth investigation of the child's knowledge and reception of a variety of linguistic concepts, structures, and material might aid in making more objective placement decisions, as well as providing data that could be correlated with academic achievement as the child progresses through the school system. Predictive measures are badly needed for hearing-impaired children" (Davis, 1974, p. 350).

In view of the Public Law 94-142, mandating the placement of special education pupils in the "least restrictive educational environment" and provision of Individual Educational Plans (IEP), the need for a valid and reliable diagnostic/prescriptive tool is even more critical.

"Placement of children in any particular educational setting must be effected on the basis of needs that are periodically and objectively determined. . . . The extent to which a hearing impaired child can benefit from placement in a regular class depends primarily upon that child's ability to understand and employ spoken language" (Ling, et. al., 1977, p. 206, 209).

". . . results of standardized testing can be used as a part of the data base on which the decision is made to provide or discontinue special help" (Eaves, 1977, p. 100).

To date, tests of the hearing impaired pupil's utilization of residual hearing for speech have had severe limitations, especially in that they have not measured directly the auditory processing of connected language. It has been standard audiologic practice to administer tests of threshold sensitivity to pure tones and tests of speech discrimination using mono-syllabic word lists, and, from this information interpret an individual child's capacity for utilizing audition as an avenue for learning.

"Pure tone threshold responses may not reflect one's capacity to perceive more complex sounds, and threshold responses to speech do not describe one's ability to discriminate or recognize speech sounds. For these reasons, pure tone audiograms and speech reception thresholds may not yield the best estimate of a child's ability to understand speech" (Cramer, et. al., 1974, p. 304).

A review of the literature points out the severe limitations of current auditory tests. Generally, these tests have narrow application to the hearing impaired pupil population, because they: (1) are not appropriate to a broad age and degree of loss range; (2) are limited to a population with high level language competency; (3) measure only specific skills rather than differentiating among levels of auditory functioning;

"Unfortunately, most auditory tests that directly measure speech discrimination or recognition in children are not appropriate for use with severely hearing impaired or profoundly deaf children younger than about nine years of age" (Cramer, et. al., 1974, p. 304).

"There is a need for an auditory speech discrimination test specifically designed for the severely hearing impaired population. When existing speech discrimination tests are administered to members of this population, the results are usually so poor that they do not adequately differentiate between persons with obviously different hearing capabilities" (Jones, et. al, 1974, p. 531).

(4) measure sensitivity rather than comprehension; (5) are difficult to administer, score and interpret; (6) are not useful for diagnosis, placement and prescription;

"The main purpose of assessment... is to discover what the child can and cannot do with respect to educationally important objectives; once these strengths and weakness are known, instructional strategies are selected which hasten the achievement of unmastered objectives" (Eaves, et. al., 1977, p. 100).

and (7) are not sensitive as a measure of progress and growth.

"Evaluation constitutes the only logical basis for the planning of further work with a child. Only through adequate evaluation can one determine whether previous work has been successful, whether a change of approach (for example, a change from auditory-oral to visual-oral strategies), or a change of program (for example, oral to manual communication) is called for" (Ling, et. al., 1977, p. 206, 209).

The Test of Auditory Comprehension is a single, comprehensive test instrument designed to overcome the enumerated deficiencies.

Description of the TAC

The TAC was developed as one component of the Auditory Skills Instructional Planning System. Ten discrete Subtests have been designed to represent a hierarchy of auditory abilities.

Subtests One through Three assess Supra-segmental Discrimination, with decreasing redundancy (discrimination of speech phrases and non-speech sounds on the basis of pitch, loudness, length, and intonation patterns).

Description of the TAC (Cont'd.)

Subtests Four through Six assess Segmental Discrimination (discrimination of words and word phrases, from single to multiple critical elements).

Subtests Seven through Ten assess Auditory-Cognitive Skills (comprehension of simple and complex stories for sequence and detail, in quiet and in competing message conditions).

There are a total of 139 test items in the TAC, with a range of from nine to 20 items within a Subtest. Practice items precede each Subtest. All auditory stimuli are recorded on a cassette tape for uniformity of presentation and with programmed stops for ease of administration. The TAC is designed for administration through a sound field speaker with the pupil wearing his usual classroom amplification device. Graphic materials for the test are contained in two test books. The only response required of the pupil is that of pointing to a pictured alternative.

Pilot testing was accomplished on both normal hearing and hearing impaired young children, and field testing was accomplished with 104 pupils, ages three through twelve years from the Southwest School for the Hearing Impaired, Lawndale, California. Results of these studies, as well as evaluations by national consultants, supported the content validity and sequential nature of the TAC.

Statement of the Problem

The purpose of the present investigation was to gather additional information to determine the effectiveness of the TAC as an instrument for differentiating levels of auditory functioning of hearing impaired pupils and for placement in a suitable educational setting.

The two major objectives were: (1) to establish the reliability of the instrument and procedures for test administration and (2) to validate the test and standardize it for a large number of pupils.

The specific research questions was: Is the TAC a reliable and valid instrument for differentiating levels of auditory functioning in a general hearing impaired pupil population, and can it be an effective strategy to assist in determining suitability for placement in an integrated school setting?

METHODS

All pupils tested with the TAC and utilized in data analysis were between the ages of 4-0 and 12-11 years and with hearing losses greater than 40 dB HL based on the pure tone average of the better ear. Participating audiologists were asked to exclude from their testing all pupils who:

- (1) had not reached the age of four years or have exceeded the age of 12 years at time of testing,
- (2) had a mild or purely conductive loss or unilateral loss,
- (3) had multiple handicapping problems such as brain damage, mental retardation, severe visual problems, etc.,
- (4) had an adventitious loss - onset after acquisition and development of speech and language,
- (5) had moderate congestion or a cold at the time of testing, or
- (6) had a defective or inoperable hearing aid or auditory trainer.

Each pupil was tested individually wearing his usual classroom amplification; that is, the device--whether auditory trainer or personal hearing aid(s)--he uses for instructional purposes.

The only method of response required of the child was that of pointing to a pictured alternative for all subtests. Instructions to the subject could be provided by any means--verbally, written, signed, or by total communication; however, since the TAC was designed to keep necessary instructions to a minimum, no verbal response was required from the child.

Administration of the TAC, for standardization purposes, was limited to licensed or certified audiologists trained in the use of the instrument.

The TAC was administered in a sound suite (IAC or other adequately sound-treated room) with ambient room noise not exceeding 40dBA. In most situations, the TAC cassette tape was played on a pulse-reading two channel recorder with remote on/off switch. Delivery of the test stimuli was made (generally through a speech audiometer or amplifier) to a sound field speaker facing the subject at a distance (3-5 feet) providing an SPL output of 76 dB at the listening point in the test room, as measured by a Sound Level Meter on the C Scale. To insure that the TAC was administered uniformly, an "Equipment and Environment" form (Appendix B) and Warble Tone Test Tape were provided to all audiologists. Daily measurement and recording of speaker output with a sound level meter was required. For all local participating sites, the project audiologist observed initial testing and equipment setup (TAC Observation form, Appendix C). Telephone communication was maintained consistently for out-of-state participants. In some cases, where equipment was not available, pulse-reading tape recorders and/or remote control cables were provided.

All pupils were tested individually starting with administration of Subtest One and continuing sequentially until two successive subtests were failed. Audiologists marked each response the pupil made by placing a slashed line on the precoded answer sheets (TAC Response form, Appendix D). At the completion of each subtest, the examiner recorded the number of correct responses, compared that number to the minimal PASSING performance figure and circled "PASS" or "FAIL". Subtest scores were then converted to percentages and the TAC score computed by summing the percentages for subtests passed and dividing by the total number of subtests (or ten).

Results for each pupil were then transferred on to a "Profile Sheet" (Appendix E). By plotting the percentage scores achieved for each Subtest administered, a graphic display of competency for discrete auditory skills, as well as overall auditory functioning, was provided. Audiologists used the Profile Sheets as a means for interpreting TAC results to teachers and administrators.

Audiologists provided data on each pupil tested, as requested on the Response Form, regarding hearing status, onset and etiology of loss, educational placement, mode of communication, and other factors that might affect performance on the TAC. Additionally, information was gathered for each participating site regarding placement procedures and educational settings available for hearing impaired pupils (Placement Information form, Appendix F).

All pupil response forms, upon return to the project office, were checked and recorded on fortran forms for key-punching and computer analysis. Following preliminary data analysis by cell, participating audiologists were contacted and asked to complete a detailed questionnaire on selected pupils who scored extremely high or low for their age and degree of loss category.

Reliability

The TAC manual, Preliminary Edition, was pilot tested by naive audiologists and TAC administration was practiced by the project audiologist. From observation of the testing and reports by pilot administrators, no revisions in the TAC manual were found necessary.

Of the total 750 pupils involved in the study, 82 were retested for determining test-retest reliability. They ranged in age from four to twelve years with moderate through profound hearing losses. Sixty of these pupils, tested by the project audiologist, were from a local day school for the hearing impaired utilizing total communication. The majority of pupils were classified as having severe (N=19) or profound (N=35) losses and spent their educational day in special self-contained classrooms for the hearing impaired.

In addition to the sixty pupils from the local area, 22 pupils from an out-of-state public school district were included in the test-retest data, in order to obtain a more representative population. Class settings for these pupils included some self-contained classrooms as well as partial or full integration in regular (normal hearing) classrooms. Eight pupils had moderate to moderate/severe losses and 14 had severe to profound losses. All pupils from this site utilized oral communication.

All pupils were retested on the TAC within a period of 2-3 weeks following initial testing. Of the 60 pupils tested from the local site, 29 were retested by the project audiologist, 16 by a second audiologist, and 15 by a third audiologist in order to determine possible test administrator effect.

An examination of the characteristics of the population used in the reliability study revealed that they were representative of the standardization study and of the national hearing impaired population in special education programs. The composition of the test-retest population relative to age and degree of loss was as follows:

	4-6 YEARS	7-9 YEARS	10-12 YEARS	AVG. AGE
AGE GROUP	N=16	N=30	N=36	8.8 yrs.
	MODERATE	MOD/SEV	SEVERE	PROFOUND
DEGREE OF LOSS	N=4	N=10	N=28	N=40

Validity and Standardization

A target population of 600 pupils was originally set for obtaining normative data on the TAC for hearing impaired pupils ages four through twelve years of age, with moderate through profound hearing losses, from a variety of educational settings.

In order to test this representative sample, the TAC and Auditory Skills Instructional Planning System (ASIPS) were presented both locally and nationally to professionals and possible participating sites (Appendix G). From the interest generated, letters were sent out to approximately 100 audiologists, schools, and districts to secure class lists and commitments for administering the TAC.

Approximately 835 pupils from 29 schools and districts across the country were administered the TAC according to procedures outlined in the TAC manual. Of the total population tested, TAC results on 750 pupils, all of whom met the subject criteria, were included for data analysis. A list of the participating sites and total number of pupils tested is presented in Appendix A.

Data from the 750 pupils were arranged in the following matrix according to age grouping and degree of loss category:

	MODERATE LOSS (41-55dB)	MOD/SEV LOSS (56-70dB)	SEVERE LOSS (71-90dB)	PROFOUND LOSS (91dB +)
AGE 4-6 YEARS	N = 21	N = 29	N = 53	N = 67
AGE 7-9 YEARS	N = 21	N = 34	N = 68	N =110
AGE 10-12 YEARS	N = 31	N = 44	N = 89	N =183

The composition of the 750 pupils was representative of the national hearing impaired population in special education programs. Table I presents the number and percentage of pupils tested with respect to age, degree of loss, sex, ethnicity, class setting, onset and etiology of hearing loss, amplification and mode of communication utilized.

TABLE I:

DESCRIPTION OF TAC TEST POPULATION

N = 750

Age in years:	4	5	6	7	8	9	10	11	12
	21	72	76	87	68	81	76	113	156
	169 (22%)			236 (31%)			345 (46%)		

Degree of Loss:	Moderate	Mod/Seve	Severe	Profound
	74 (9%)	108 (14%)	208 (27%)	360 (48%)

Ethnic Group:*	Unknown	White	Black	Hispanic	Other
	6%	67%	13%	12%	2%

Communication Mode:	Oral	Total	Sex:*	Male	Female
	57%	43%		53%	47%

Class setting:	Residential School	Full-time Sp. Class	Partial Integration	Full Int. w/support	Full Int. w/o suppt.	Pre-School
	20%	50%	19%	8%	2%	< 1%

Onset of Loss:	Birth	Unknown	1-6 Mos.	7-12 Mos.	13-18Mos	19-24 Mos	25Mos. +
	67%	27%	1%	< 1%	1%	1%	2%

Etiology:*	Unknown	Rubella	Hereditary	Meningitis	prematurity	Other
	49%	26%	12%	4%	3%	6%

Amplification:	Auditory Trainer	Body Aid	Ear Level Aid	Monaural	Binaural
	230 (30%)	161 (21%)	356 (47%)	207 (27%)	447 (59%)

* These statistics are in close agreement with the Annual Survey of Hearing Impaired Children and Youth, Office of Demographic Studies, Gallaudet College, Washington, D.C., 1970-73.

STATISTICAL APPROACH AND ANALYSIS

Reliability measurements

Means, standard deviations and Pearson Product Moment Correlations were computed from the raw scores of 82 hearing impaired pupils. These statistics were obtained on the total and individual subtests of the TAC. Additionally, analysis of variance measures were applied to the test-retest data on 60 pupils, retested by three audiologists.

Total Population Statistics

Means, standard deviations, and, where appropriate t-tests and analysis of variance were computed from the raw scores, TAC Scores, and number of subtests passed for the 750 pupils.

Similar data were obtained for the total population tested by age and degree of loss category (arranged in a matrix), cell by mode of communication, cell by educational setting, sex, ethnicity, and audiological contour.

Item Analysis

An item analysis was performed on the results of 695 of the 750 pupils yielding a table of the frequency, and absolute and relative percentage of the population choosing each of the alternatives for 139 test items of the TAC.

TAC Evaluation

All participating audiologists were asked to complete an evaluation questionnaire concerning the appropriateness, usefulness, and content validity of the TAC. All responses were collated and average ratings for all items were obtained (Appendix H). General comments are included for further support of the acceptance and validity of the TAC.

DATA PRESENTATION AND RESULTS

Reliability of the TAC

Pearson Product Moment correlation coefficients were obtained from test-retest results on 82 hearing impaired pupils. Overall TAC reliability was .98. Reliability coefficients, means and standard deviations for pre/post testing on the ten subtests of the TAC are presented in Table II. A modest positive correlation was found for age and TAC performance (pre = .42; post = .41), indicating that the older age groups scored somewhat better on the Test. A strong negative correlation was found for degree of loss and performance on the TAC (pre = -.61; post = -.63). These results show that the TAC is a reliable test and could be used as a measure of progress in the acquisition of auditory skills.

TABLE II: Test-Retest Reliability. Average raw scores, standard deviations and reliability coefficients for each of the ten Subtests based on pre-post results of 82 hearing impaired pupils. A = Initial Test; B = Retest.

SUBTEST	NO. ITEMS		N	MEAN	S.D.	RELIABILITY	N	SIG. LEVEL
ONE	10	A	79	8.8	2.1	.69	78	.001
		B	80	9.2	1.9			
TWO	15	A	71	11.7	3.8	.89	68	.001
		B	74	12.3	3.6			
THREE	15	A	61	9.4	4.6	.91	61	.001
		B	70	10.2	4.4			
FOUR	20	A	45	16.0	4.8	.83	45	.001
		B	53	15.4	5.9			
FIVE	15	A	34	12.9	2.5	.87	34	.001
		B	37	13.3	2.7			
SIX	15	A	33	10.8	3.1	.74	33	.001
		B	36	11.9	3.5			
SEVEN	15	A	31	10.4	3.7	.92	31	.001
		B	34	11.0	3.6			
EIGHT	15	A	24	8.9	3.9	.92	24	.001
		B	26	9.2	4.7			
NINE	9	A	16	4.3	2.2	.77	16	.001
		B	17	4.8	2.6			
TEN	10	A	9	5.1	2.1	.66	9	.027
		B	9	7.0	2.1			
TOTAL	139	A	82	52.	42.7	.98	82	.001
		B	82	58.	43.7			

An analysis of variance was computed on 60 hearing impaired pupils who were retested on the TAC two-three weeks after initial tests by three audiologists. Table III represents the mean pre/post TAC scores and difference scores obtained. The F ratio of 1.34 is not considered statistically significant, indicating that the TAC results are not significantly affected by the examiner.

TABLE III: Inter-Examiner Reliability. Mean pre/post TAC scores, difference scores, and analysis of variance for 60 hearing impaired pupils.

RETEST AUDIOLOGIST	NO. OF PUPILS	MEAN TAC-PRE	MEAN TAC-POST	DIFFERENCE	ANALYSIS OF VARIANCE
S.O.	29	13.4	16.7	3.3	F=1.37 Not Significant
D.R.	16	21.3	27.1	5.8	
N.S.	15	14.2	20.1	5.9	

Validation of the TAC - Standardization Data

The hierarchical nature of the ten subtests of the TAC, validated in the preliminary field test study, is supported by the results on 750 hearing impaired pupils used in the present study. The percentage of the population passing each Subtest is shown in Figure 1. These results indicate that the subtests are ordered in difficulty, as shown by the stair-step progression, both within the broader areas of receptive auditory abilities assessed (discrimination, memory-sequencing, and figure-ground) as well as across the entire TAC battery.

The lined area indicated for Subtest Three reflects a correction in the passing criterion for that subtest from 11 out of 15 correct (73%) to 9 out of 15 correct (60%). Originally, passing criteria were set based only on the number of test items and number of alternatives. No consideration was given to the type of task involved in terms of "open" or "closed" message set.

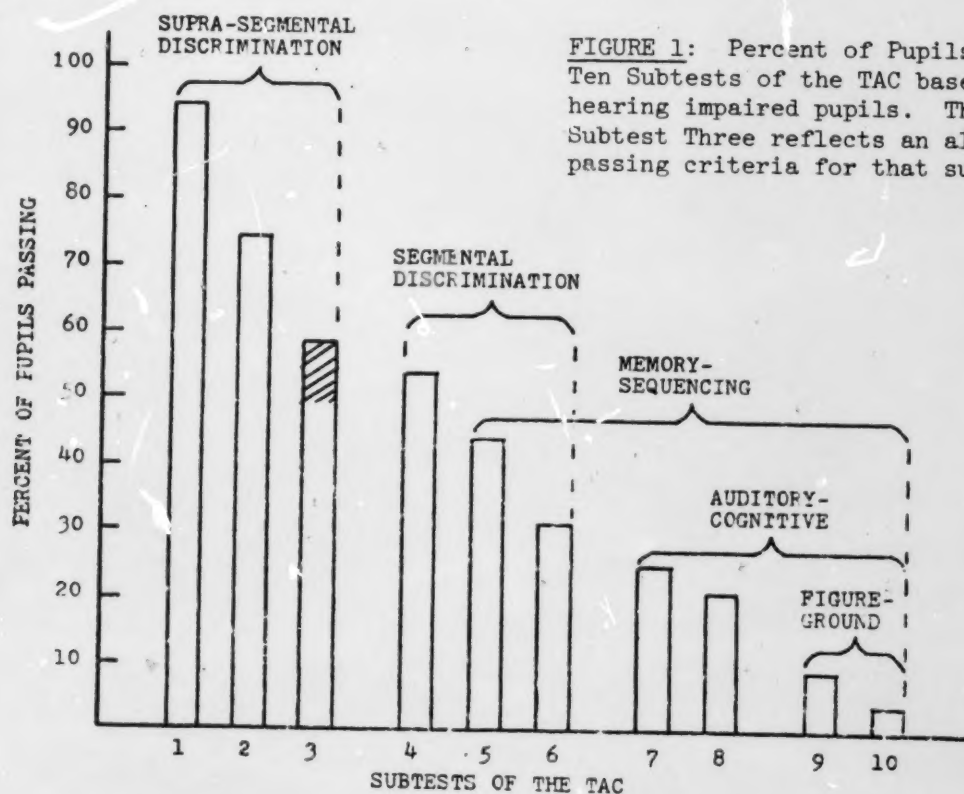


FIGURE 1: Percent of Pupils Passing each of the Ten Subtests of the TAC based on results of 750 hearing impaired pupils. The lined area of Subtest Three reflects an alteration of the passing criteria for that subtest from 73% to 60%.

The construction of Subtest Three is much more of an open set (the nature of the auditory stimuli is not specifically defined by the graphic alternatives) than for surrounding subtests, Two and Four.

A lowering of the passing criterion to 60% also appears to be warranted based on the results of 22 pupils who failed Subtest Three by no more than 2 items, and subsequently passed Subtest Four. This alteration in the passing criterion for Subtest Three does not affect the reliability and standardization data obtained on the 750 pupils since raw scores, which were used for statistical analysis, remain unchanged.

TAC results for the total population were arranged in a matrix and analyzed as a function of age (grouped for ages 4-6, 7-9, and 10-12 years) and degree of loss category as determined by the pure tone average for the better ear (moderate loss, 41-55dB; moderate/severe loss, 56-70dB; severe loss, 71-90dB; and profound loss, 91dB and greater).

Table IV presents the number of pupils tested, mean raw score, and standard deviation for each cell of the age and degree of loss matrix. In similar format, average TAC scores, range in scores, and average number of subtests passed are presented in Table V. Note the consistent progression of scores for age, from the youngest to the oldest pupils, and for degree of loss, from profound to moderate hearing losses.

TAC Performance by Age and Degree of Loss

When analyzed as a function of age (Figure 2) results show that the TAC is indeed appropriate for use with a broad age range and the population for which it was developed, ages four through twelve years.

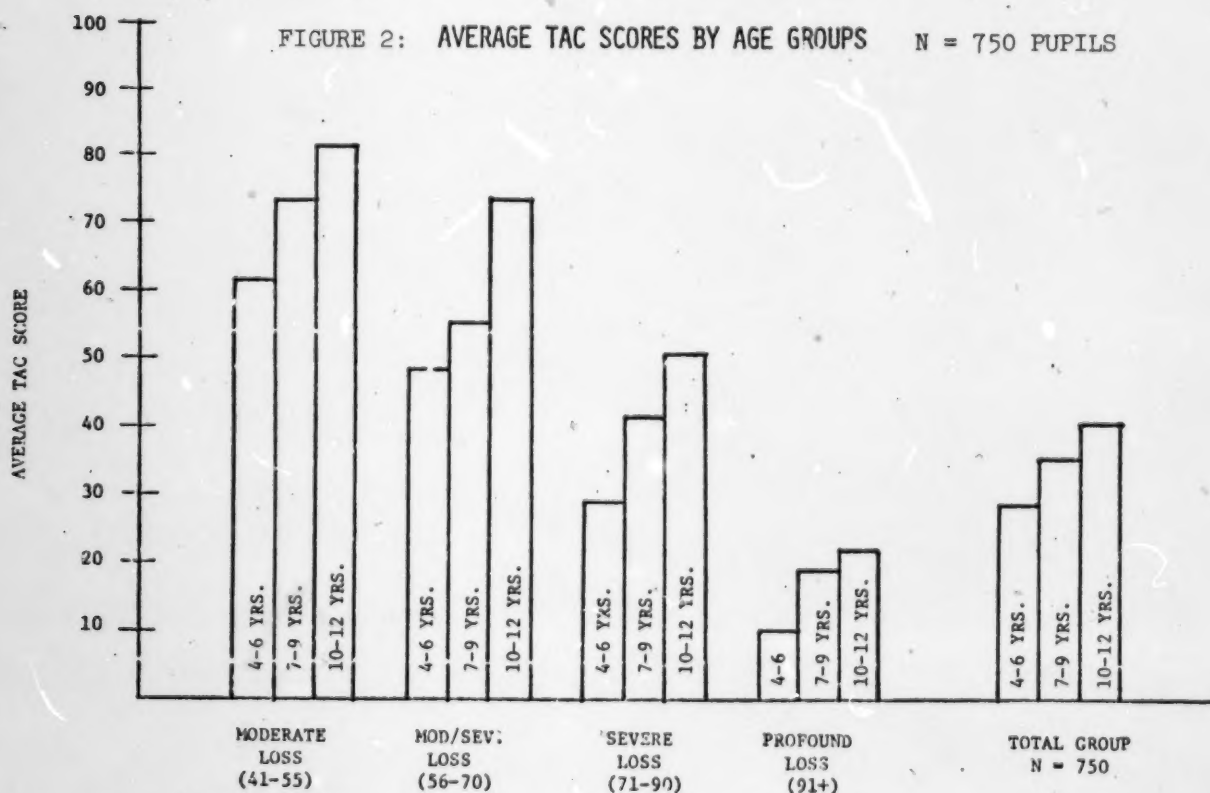


TABLE IV: TAC STANDARDIZATION STUDY: RAW SCORE DATA N=750

	MODERATE LOSS	MOD/SEV LOSS	SEVERE LOSS	PROFOUND LOSS
4 - 6 YEARS	N = 21 $\bar{x}$ = 100.4 S.D. = 27	N = 29 $\bar{x}$ = 84.5 S.D. = 27	N = 53 $\bar{x}$ = 56.1 S.D. = 30	N = 67 $\bar{x}$ = 26.7 S.D. = 17
7 - 9 YEARS	N = 21 $\bar{x}$ = 116.1 S.D. = 19	N = 31 $\bar{x}$ = 89.5 S.D. = 32	N = 68 $\bar{x}$ = 72.3 S.D. = 33	N = 110 $\bar{x}$ = 39.3 S.D. = 27
10 - 12 YEARS	N = 31 $\bar{x}$ = 121.0 S.D. = 26	N = 44 $\bar{x}$ = 112.5 S.D. = 23	N = 89 $\bar{x}$ = 86.6 S.D. = 30	N = 183 $\bar{x}$ = 42.0 S.D. = 24

TABLE V: TAC STANDARDIZATION STUDY: TAC SCORE AND SUBTEST DATA N=750

	MODERATE LOSS	MOD/SEV LOSS	SEVERE LOSS	PROFOUND LOSS
4 - 6 YEARS	62 - 7 n = 21 TAC mean = 62.1 TAC range = 0-97 Sub. passed = 6.7	49 - 5 n = 29 TAC mean = 49.2 TAC range = 8-77 Sub. passed = 5.2	30 - 3 n = 53 TAC mean = 30.2 TAC range = 0-70 Sub. passed = 3.4	10 - 1 n = 67 TAC mean = 10.4 TAC range = 0-52 Sub. passed = 1.1
7 - 9 YEARS	75 - 8 n = 21 TAC mean = 74.6 TAC range = 44-98 Sub. passed = 7.9	55 - 6 n = 34 TAC mean = 55.1 TAC range = 10-90 Sub. passed = 5.9	42 - 5 n = 68 TAC mean = 41.6 TAC range = 0-96 Sub. passed = 4.5	19 - 2 n = 110 TAC mean = 19.4 TAC range = 0-76 Sub. passed = 2.1
10 - 12 YEARS	82 - 9 n = 31 TAC mean = 82.2 TAC range = 0-98 Sub. passed = 8.7	72 - 8 n = 44 TAC mean = 72.0 TAC range = 19-99 Sub. passed = 7.6	51 - 6 n = 89 TAC mean = 50.7 TAC range = 10-98 Sub. passed = 5.5	22 - 2 n = 183 TAC mean = 21.6 TAC range = 0-84 Sub. passed = 2.4

When mean results are computed for each age, four through twelve years, it can be seen that TAC performance is fairly consistent for ages 6-10 with raw scores ranging from 60 to 67. The largest jump in scores occurs between age five and six years where the difference in mean raw scores is 21. A much smaller difference is seen for the older pupils, age 10 and 12 years. These results indicate that the content and language of the TAC kept to a minimal level so as to serve the youngest of the population, while still serving as a discriminative tool for the older pupils tested. Mean TAC data by age are presented in Table VI (below) and Figure 3 (page 14).

TABLE VI: Average TAC Performance by Age. Mean TAC scores, number of subtests passed, and standard deviations for each age and age group.

	No. of Pupils	TAC Score	Subtests Passed	Raw Score	S.D.
Age 4 years	21	24	3	48	32
Age 5 years	72	23	3	45	34
Age 6 years	76	37	4	66	38
Age 7 years	87	34	4	60	39
Age 8 years	68	38	4	67	36
Age 9 years	81	36	4	63	41
Age 10 years	76	37	4	62	41
Age 11 years	113	43	5	72	43
Age 12 years	156	42	5	71	38
Age 4-6 yrs.	168	30	3.2	55	37
Age 7-9 yrs.	237	36	3.9	63	39
Age 10-12 yrs.	345	41	4.4	69	40

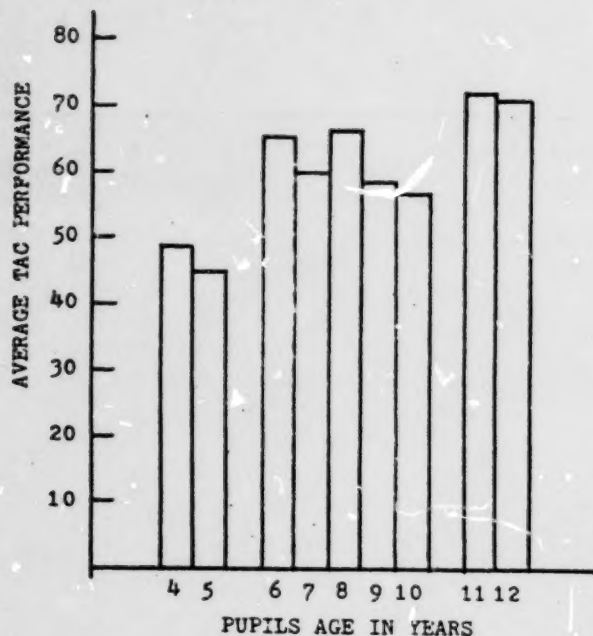


FIGURE 3: Average TAC Performance by age based on 750 hearing impaired pupils.

In Figure 4, average TAC performance is graphed as a function of degree of loss.

These results show that the TAC is indeed appropriate for pupils with varying degrees of hearing impairment, and that the TAC does differentiate among levels of auditory functioning. Note the large steps differentiating degree of loss categories, in contrast to the smaller steps when TAC performance is graphed by age. (Figure 2, page 11). Table VII presents average TAC scores, number of subtests passed, raw scores, and standard deviations for the 750 pupils grouped according to degree of loss.

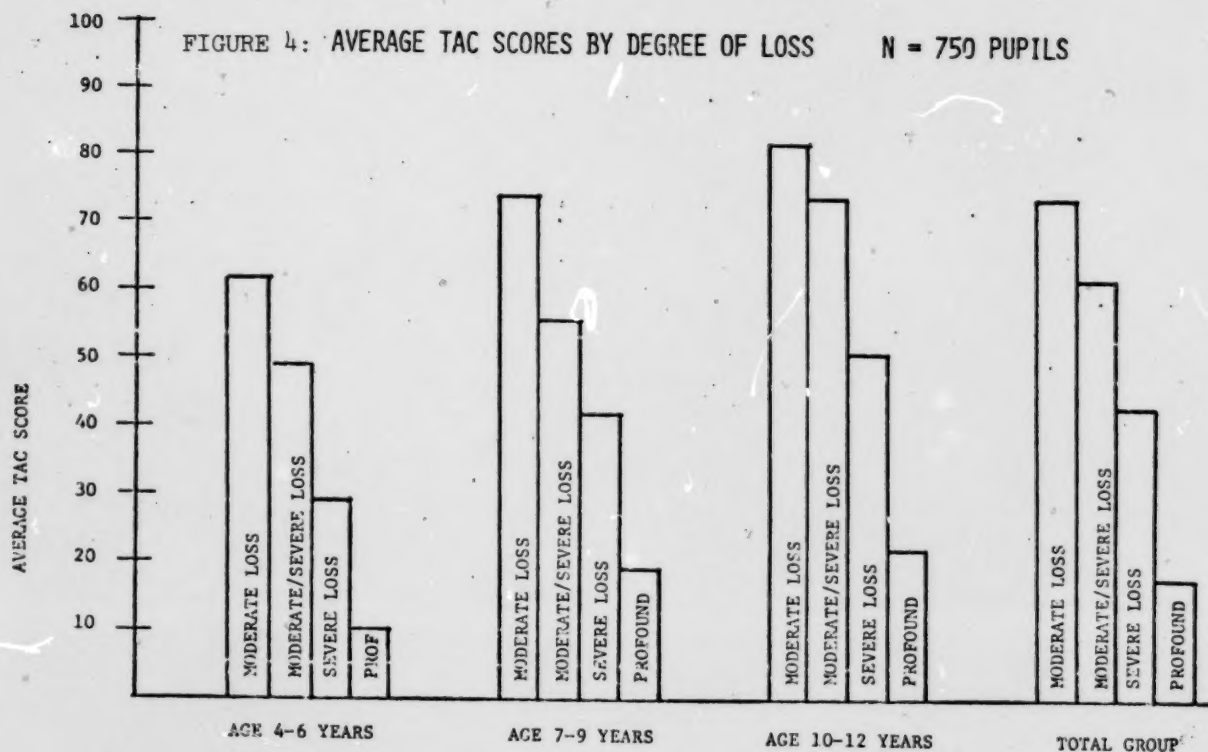


TABLE VII: Average TAC Performance by Degree of Loss. Mean TAC scores, number of subtests passed, raw scores and standard deviations for 750 hearing impaired pupils.

<u>DEGREE OF LOSS</u>	No. of Pupils	TAC Score	Subtests Passed	Raw Score	S.D.
Moderate Loss (41-55 dB)	74	73	8	111	30
Mod/Sev. Loss (56-70 dB)	108	60	6	98	30
Severe Loss (71-90 dB)	208	43	5	74	33
Profound Loss (91 dB +)	350	19	2	38	25

All of the graphic data has been presented for mean TAC scores, raw scores, and number of subtests passed. The range of individual scores for each cell or category, however is very wide. Information derived from the range of scores adds greatly to the diagnostic and prescriptive value of the TAC. Pupils scoring extremely high or low for their age and degree of loss cell have been identified and participating audiologists have been asked to complete a detailed questionnaire on those pupils. When these questionnaires are returned, the project staff will try to further delineate the factors affecting the successful acquisition of auditory skills.

Performance by Educational Setting

The use of the TAC as a placement tool is supported by the average TAC scores achieved by the 750 pupils grouped into four distinct educational settings. In Figure 5, average performance scores are graphed as a function of degree of loss (moderate to profound) and educational setting (full-time special self-contained classes, partial integration with regular students, and full integration into the regular or normal hearing classroom. These results suggest that the TAC would be of great value for educational placement teams as an aid in making Individual Educational Plans (IEP) for hearing impaired pupils, as well as placing pupils in the "least restrictive educational environment" as mandated in Public Law 94-142.

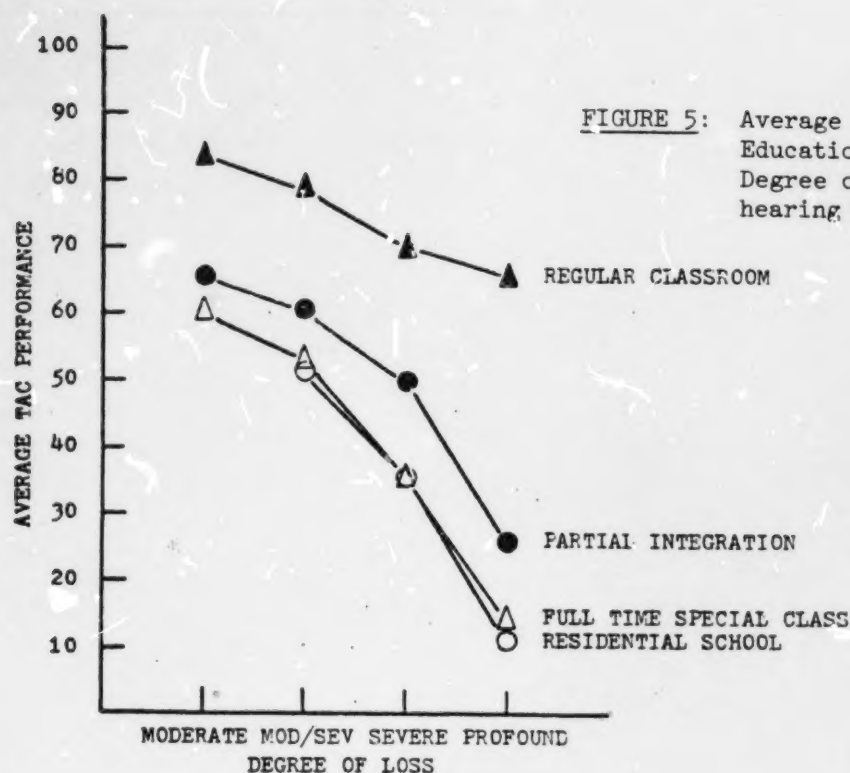


TABLE VIII: Average TAC Scores and number of Subtests passed obtained for pupils in various educational settings.

		MODERATE	MOD/SEV	SEVERE	PROFOUND
Residential Schools	N=	1	3	11	29
Resident pupils	TAC=	41-5	53-6	37-4	21-2
Residential Schools	N=	0	2	20	80
Day time pupils	TAC=	----	52-6	37-4	16-2
Special Full time	N=	20	51	108	193
Classrooms	TAC=	60-5	53-6	37-4	17-2
Special Class-1/2 time	N=	15	26	49	50
Partial Integration	TAC=	66-7	61-7	51-6	25-3
Itinerant Pupils	N=	24	19	16	5
with Support	TAC=	82-9	77-8	72-8	66-7
Itinerant Pupils	N=	12	5	1	0
without Support	TAC=	86-9	76-8	60-7	----
PreSchool Pupils	N=	1	1	2	2
(Special Class)	TAC=	54-6	55-6	15-2	10-1

TAC Performance by Communication Mod

When the mean TAC scores are graphed as a function of mode of communication (oral and total) and degree of loss (moderate through profound), as presented in Figure 6, it is readily apparent that pupils using oral communication did better on the TAC than pupils utilizing total communication. When scores are compared by cell, these differences, with two exceptions, are consistently observed. The exceptions noted are for pupils age 7-9 with moderate loss and pupils age 4-6 with profound loss. Table IX presents the number of pupils tested, average TAC score and number of subtests passed for pupils utilizing oral and total communication modes across four degree of loss categories.

FIGURE 6: Average TAC Performance by Communication Mode and degree of loss category based on 730 hearing impaired pupils.

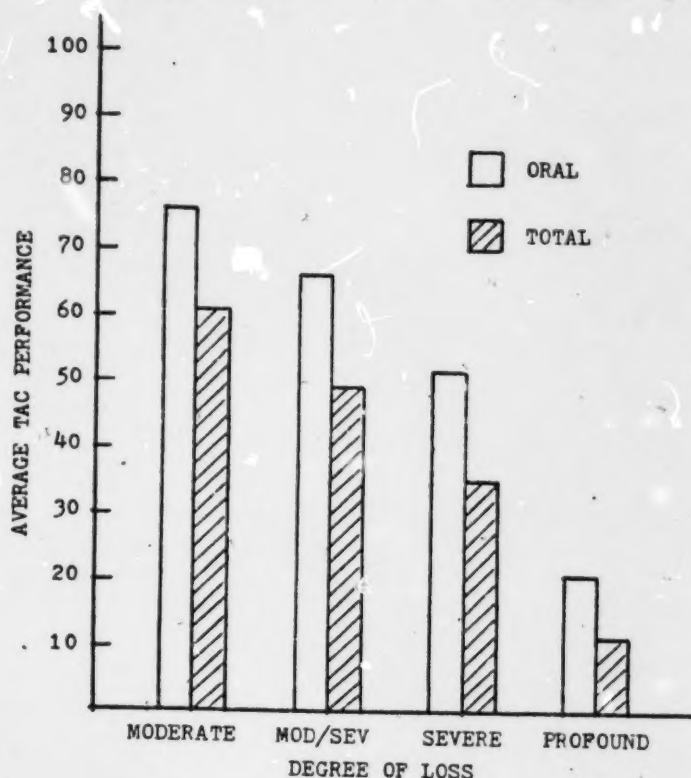


TABLE IX: Average TAC Scores and number of subtests passed obtained for pupils using Oral and Total Communication.

		MODEPATE	MOD/SEV	SEVERE	PROFOUND
ORAL Pupils	N=	56	77	106	194
	TAC=	76-8	66-7	52-6	21-2
TOTAL Pupils	N=	18	29	89	161
	TAC=	61-7	42-5	35-4	17-2

TAC Performance by Ethnicity and Sex

The standardization population was composed primarily of three ethnic groups: White, Black, and Hispanic. When average TAC performance was computed by ethnic group, statistically significant differences were found. An analysis of variance test applied to the data yielded $F = 2.49$. Note that mean scores for the Black, Hispanic, and all Other groups were almost identical. The significantly higher scores achieved by pupils for whom ethnic background was not reported might reflect the large percentage of these pupils fully integrated into regular (normal hearing) classrooms.

TABLE X: Average TAC Scores by Ethnic Group. Mean TAC scores, number of subtests passed, raw scores and standard deviations for hearing impaired pupils.

<u>ETHNIC GROUP</u>	No. of Pupils	TAC Score	Subtests Passed	Raw Score	S.D.
White	505	38	4	66	39
Black	95	32	3	56	35
Hispanic	87	32	3	56	40
Other	22	32	3	57	--
Not Reported	41	51	5	83	42

Approximately 53% of the total population (750 hearing impaired pupils) were male and 47% female. These percentages coincide with the latest demographic studies by Gallaudet College, Washington, D.C., for 1972-73. Average TAC Scores, number of subtests passed, raw scores and standard deviations for male and female pupils are presented in Table XI. Analysis of variance showed there to be a statistically significant difference in performance on the TAC ($F=2.41$). However, comparing scores on the basis of sex by age groups, female pupils did better than male pupils for ages 4-6; male pupils scored higher than female pupils for ages 7-9; and there was no significant difference between scores for the age group 10-12 years.

TABLE XI: Average TAC Scores by Sex. Mean TAC scores, number of subtests passed, raw scores and standard deviations for 397 male and 350 female pupils.

<u>SEX</u>	No. of Pupils	TAC Score	Subtests Passed	Raw Score	S.D.
Male	397	39	4	67	39
Female	350	34	4	61	39

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Test of Auditory Comprehension (TAC), one component of the Auditory Skills Instructional Planning System, is a comprehensive evaluation instrument designed for hearing impaired pupils, ages four through twelve years, for assessing receptive auditory functioning. Ten discrete subtests, ordered in difficulty, have been designed to provide a profile of a pupil's use of residual hearing and auditory processing of connected language. Results of pilot tests and field-testing with young normal hearing children and hearing impaired pupils ages three through twelve years confirmed the content validity of the TAC.

The purpose of the present investigation was to establish the reliability of the instrument and of the administration procedures, and to determine the effectiveness of the TAC for differentiating levels of auditory functioning of hearing impaired pupils and for placement in a suitable educational setting.

In the present study, the TAC was administered to 750 hearing impaired pupils, ages four through twelve years, with hearing losses from moderate through profound, and from a variety of educational settings. The sample population was nation-wide, including 29 schools and districts. Results were analyzed by age (grouped for 4-6 year old pupils, 7-9 year old pupils, and 10-12 year old pupils) and degree of loss (moderate, moderate/severe, severe, and profound losses as classified by the better ear pure tone average). Results of average TAC scores indicated consistent progressions for TAC performance as a function of age (from the youngest age group to the oldest age group). However, the TAC was shown to be appropriate for a broad age range and the population for which it was designed. In fact, there were no significant differences in performance for ages six through ten years.

When TAC scores were analyzed as a function of degree of loss, a strong negative correlation was found. The average TAC scores differentiated well among levels of hearing impairment and auditory functioning from moderate through profound losses. These results indicate that the TAC is indeed appropriate for all degrees of hearing impairment. Additional verification of the appropriateness of the TAC can be seen in the relationship of TAC performance to type of class setting, with a consistent progression in test scores noted from the most to the least restrictive educational environment.

Test-retest reliability coefficients were obtained on 82 hearing impaired pupils who were readministered the TAC within a 2-3 week period. The overall test-retest reliability was .98, indicating that the TAC is a very reliable instrument and can be administered periodically to measure progress in the acquisition of auditory skills.

Computed analysis of variance revealed no significant differences by examiner, suggesting that the TAC can be administered by any audiologist following the prescribed procedures outlined in the manual.

In summary, the Test of Auditory Comprehension (TAC) has been shown to be a reliable and valid instrument, and one which is:

- (1) appropriate for a broad age range
- (2) appropriate for all degrees of hearing impairment

- (3) not limited to pupils with a high degree of language competence and,
- (4) easily administered, scored, and interpreted

Results of the TAC can be utilized as:

- (1) a comprehensive evaluation of auditory functioning
- (2) an indication of the capacity for utilizing audition as an avenue for learning
- (3) a tool for placement on the Auditory Skills Curriculum and selection of specific auditory skill objectives
- (4) a predictor for appropriate educational placement and,
- (5) a measure of progress in the acquisition of auditory skills

Additionally, numerous professionals in the field of special education have suggested that the TAC might have great value for populations other than the hearing impaired. However, this has not been empirically determined, but has been viewed as worthy of further study.

The TAC standardization data provides educators of the hearing impaired with specific information not previously available. This should contribute to knowledge essential for predicting success in an integrated school setting ("least restrictive educational environment") and for use in writing a prescriptive program ("Individual Educational Plan--IEP") as mandated by PL 94-142 for all special education pupils.

TAC results also provide a valid and reliable measurement of auditory skill functioning and progress, as related to receptive language development, and aid in eliminating at least part of the subjectivity and necessity to rely on experiential information when interpreting an audiogram.

The results from this study have served as a springboard to other planned studies. The Office of the Los Angeles County Superintendent of Schools has funded, for the 1977-78 academic year, two studies on the TAC: (1) administration of the TAC to exceptionalities other than the hearing impaired (including Educationally Handicapped, Severe Language Disorders/Aphasia, and Trainable Mentally Retarded) to determine applicability of the TAC to these populations; and (2) administration of the TAC to normal hearing six and seven year old pupils for the purpose of obtaining normative information, which will aid teachers who have mainstreamed special education pupils.

The Office of the Los Angeles County Superintendent of Schools is presently involved in securing a publisher for the Auditory Skills Instructional Planning System (ASIPS). Request for Proposals No. 305 ("Publication and Distribution of the ASIPS") was sent to 28 publishing companies and a Publishers' Bidding Conference was held at the Los Angeles County Education Center, Downey, California in July, 1977. Terms of the contract contained in the RFP document state that the System will be published within one year after the contract has been awarded (scheduled for October 26, 1977).

It is anticipated that the Test of Auditory Comprehension, as well as the other components of the Auditory Skills Instructional Planning System (Auditory Skills Curriculum, Mediated Activities, and Inservice Materials), will be of universal importance, and will be an effective means of bringing together the educational audiologist and the educator of the hearing impaired for the benefit of the hearing impaired child.

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APPENDICES

- A. List of Participating Audiologists and Sites
- B. TAC Administration Equipment and Environment Form
- C. TAC Observation Report Form
- D. TAC Response Form
- E. TAC Profile Sheet
- F. TAC Placement Information Form
- G. Public Information Presentations and Exhibits
- H. Evaluation of the Test of Auditory Comprehension

APPENDIX A

PARTICIPATING AUDIOLOGISTS AND SITES

School/District	Audiologist(s)	Number Tested
Taft School for the Aurally Handicapped, Santa Ana, CA	Susan Owens*, Douglas Richards, Nancy Steele	87 (60 - retest)
Lexington School for the Deaf Jackson Heights, NY	Janet Head, Mary Jo Osberger	100
Southwest School for the Hearing Impaired, Lawndale, CA	Susan Owens, Julie Francis Richard Witlen, Debra Schepard	54
Ventura County Schools, Ventura, CA	Elizabeth Martin	29
Long Beach Unified School District, Long Beach, CA	Susan Owens	11
Oralingua School for the Hearing Impaired, Whittier, CA	Linda Jaye, Susan Owens	12
Centralia Unified School District, Centralia, CA	Gene Renck	75
Carlsbad Unified School District, Carlsbad, CA	Rose Marie Davis, Dennis Landesman	22
Willie Ross School for the Deaf, Longmeadow, MA	Carole Tomassetti, M. Rhode, Tom Gugliotti, Paul Espesslis	35
University of Illinois Champaign-Urbana, IL	John O'Neill, Ph.D., Jan Colton, Ph.D.	18
Central Institute for the Deaf St. Louis, MO	Norman Erber, Ph.D., Irvin Shore	45
The Austine School Brattleboro, VT	Barbara Stroup	19
Little Lake School District Santa Fe Springs, CA	Susan Owens	16
West Suburban Association Lombard, IL	Bonita Simon	16
Garden Grove Unified School Garden Grove, CA	Susan Owens	10

*Project Audiologist

PARTICIPATING AUDIOLOGISTS AND SITES, Continued

School/District	Audiologist(s)	Number Tested
Denver Public Schools Denver, CO	Mary Lou Seeliger	56 (22 - retest)
Hillsborough County Schools Tampa, FL	Helen Gladwin	13
Covina Valley Unified School Covina, CA	Al Marconi	21
A. G. Bell School Columbus, OH	Helen Fulton	20
Kendall Demonstration School Gallaudet, Washington, D.C.	Jean Moore, Evelyn Skalka	51
Orange Unified School District Orange, CA	Susan Owens	7
Los Angeles City Schools Los Angeles, CA	Diane Mabry, Rosa Osuna, Joan Nassberg	24
Lincoln Public Schools Lincoln, NE	Marcia Kushner	29
Pomona Unified School District Pomona, CA	Richard Lewis, Ph.D.	31
Bellflower Unified School District Bellflower, CA	Susan Owens	5
Alhambra Unified School District Alhambra, CA	William Ritchie	11
California State University, Fresno Fresno, CA	Karen Jensen, Dennis Arnst, Ph.D.	5
Mt. Diablo Unified School District Mt. Diablo, CA	Nancy Brixey	13

TAC ADMINISTRATION

EQUIPMENT AND ENVIRONMENT

Please fill out this form and return with completed test data.

A. Equipment:

- 1) Audiometer Mfg. _____ Model _____
- 2) Tape Recorder Mfg. _____ Model _____
- 3) Test Speaker Mfg. _____ Model _____
 Wall mounted _____ Floor _____
- 4) Sound Level Meter .. Mfg. _____ Model _____
- 5) Test Room Mfg. _____ Model _____
 Double walled _____ Single _____
- 6) Control Room Double walled _____ Single _____

B. Environment:

- 1) Ambient Noise Level in Test Room _____ dB as measured on the A Scale of the Sound Level Meter.
- 2) Distance from loudspeaker to calibration point (average listening point) in test room _____
- 3) Distance from calibration point to floor _____

C. Measurement/Calibration:

- 1) Speaker measurement -- Set speech noise calibration signal at beginning of Warble-tone Test Tape to OVU on the audiometer. Adjust attenuator to provide output through the speaker of 90dB SPL (linear). Do not change levels for remainder of the calibration measurements. Measure the following frequencies with the SLM at the calibration point in the test room: (Note: You may not be able to accurately measure some of the lower frequencies.)

Hz	dB (Lin)
40	
50	
70	
100	
150	

Hz	dB (Lin)
200	
300	
400	
500	
1000	

Hz	dB (Lin)
2000	
3000	
4000	
5000	
8000	

APPENDIX C
TAC OBSERVATION REPORT

Site _____ Audiologist _____

Date _____ By _____

1. EQUIPMENT SET UP:

a) Tape recorder _____

b) Remote _____

c) Sp. Aud. _____

d) Speaker _____

2. TEST ROOM CONDITIONS:

a) Test point/seating _____

b) Ambient noise _____

3. PRE-TEST PROCEDURES:

a) Setting up equipment _____

b) Calibration _____

c) Response form information _____

d) Instructions to student _____

4. ADMINISTRATION PROCEDURES: _____

5. RECORDING RESPONSES: _____

6. GENERAL COMMENTS: _____

7. SUGGESTIONS MADE: _____

8. FOLLOW UP: _____

Test of Auditory Comprehension

RESPONSE FORM

Name _____ Sex _____ Birthdate _____ CA _____ Test Date _____

School _____ Teacher _____ Examiner _____

Year in School _____ Class Setting _____

Ethnic Grp. _____ Communication Mode _____

Type Loss _____ Onset & Etiology _____

Date of Most Recent Hearing Test _____ Better Ear _____

RE: 500 Hz _____, 1000 Hz _____, 2000 Hz _____; PTA _____ dB HL

LE: 500 Hz _____, 1000 Hz _____, 2000 Hz _____; PTA _____ dB HL

Type of Amplification _____ Settings _____

Is the amplification device in good working order? _____

Does the child appear to have a cold or be congested? _____

Does the child exhibit any problems other than hearing loss? _____

SUBTEST NO.	Raw Score	Pass/Fail	% Score PASSING	% Score FAILING
ONE	/10			
TWO	/15			
THREE	/15			
FOUR	/20			
FIVE	/15			
SIX	/15			
SEVEN	/15			
EIGHT	/15			
NINE	/9			
TEN	/10			

TOTAL =

TAC SCORE*	# SUBTESTS PASSED
—	

* + total by 10, round

Comments: _____

(1) Is class placement appropriate for this student? Yes _____ No _____

(2) If no, what would be ideal placement: _____

SCREENING TASK

Practice Items:

- ① ② ③ ④ ⑤

Test Items:

- ① ② ③ ④ ⑤
⑥ ⑦ ⑧ ⑨ ⑩

Must correctly respond
to 8 of 10 utterances.

SUBTEST ONE

Practice Items:

1. a (b)
2. a (b)
3. (a) b
4. a (b)
5. (a) b

Test Items:

1. (a) b
2. a (b)
3. (a) b
4. (a) b
5. a (b)
6. a (b)
7. (a) b
8. (a) b
9. a (b)
10. (a) b

No. Correct _____ (8)

PASS FAIL

35

Time Test Started _____

SUBTEST TWO

Practice Items:

1. (a) b c
2. a b (c)
3. (a) b c
4. a b (c)
5. a (b) c

Test Items:

1. a (b) c
2. (a) b c
3. a (b) c
4. a (b) c
5. (a) b c
6. a b (c)
7. (a) b c
8. (a) b c
9. a (b) c
10. a b (c)
11. (a) b c
12. a b (c)
13. a (b) c
14. (a) b c
15. a b (c)

No. Correct _____ (11)

PASS FAIL

SUBTEST THREE

Practice Items:

1. a (b) c
2. (a) b c
3. a b (c)
4. a (b) c
5. (a) b c

Test Items:

1. a b (c)
2. a (b) c
3. a b (c)
4. (a) b c
5. a (b) c
6. (a) b c
7. a b (c)
8. a b (c)
9. (a) b c
10. a (b) c
11. a b (c)
12. a (b) c
13. (a) b c
14. (a) b c
15. a (b) c

No. Correct _____ (11)

PASS FAIL

SUBTEST FOUR

Practice Items:

1. a b c (d)
2. (a) b c d
3. (a) b c d
4. a b (c) d
5. a b c d

Test Items:

1. a (b) c d
2. a b c (d)
3. a b c (d)
4. a b (c) d
5. a b c (d)

(Turn Book Over)

6. a (b) c d
7. (a) b c d
8. (a) b c d
9. a b c (d)
10. (a) b c d
11. a (b) c d
12. a b c (d)
13. a (b) c d
14. (a) b c d
15. a (b) c d
16. a b c (d)
17. (a) b c d
18. a b c (d)
19. a b c (d)
20. a b c (d)

No. Correct _____ (14)

PASS FAIL

36

SUBTEST FIVE

Practice Items:

1. a b c (d)
2. (a) b c d
3. a b (c) d
4. (a) b c d
5. a b c (d)

Test Items:

1. a b c (d)
2. a b (c) d
3. a b c (d)
4. a (b) c d
5. (a) b c d
6. a b c (d)
7. a (b) c d
8. a (b) c d
9. a b c (d)
10. a b c (d)
11. (a) b c d
12. a (b) c d
13. a b (c) d
14. (a) b c d
15. a (b) c d

No. Correct _____ (10)

PASS FAIL

SUBTEST SIX

Practice Items:

1. a (b) c d e
2. a b c (d) e
3. a b c d (e)
4. (a) b c d e
5. a b (c) d e

Test Items:

1. (a) b c d e
2. a b c d (e)
3. a b c d (e)
4. a b (c) d e
5. a b c (d) e
6. a (b) c d e
7. a b (c) d e
8. (a) b c d e
9. a b c d (e)
10. a b c (d) e
11. (a) b c d e
12. a b (c) d e
13. a (b) c d e
14. a (b) c d e
15. (a) b c d e

No. Correct _____ (9)

PASS FAIL

SUBTEST SEVEN

Practice Stories:

- I. 1. a (b) c d
2. a b (c) d
3. a b c (d)
- II. 4. a (b) c d
5. a b (c) d
6. (a) b c d

Test Stories:

- I. 1. a b c (d)
2. a b (c) d
3. a (b) c d
- II. 4. a b (c) d
5. a b c (d)
6. (a) b c d
- III. 7. a (b) c d
8. a b c (d)
9. a b (c) d
- IV. 10. a b (c) d
11. a (b) c d
12. (a) b c d
- V. 13. (a) b c d
14. a b (c) d
15. a (b) c d

No. Correct _____ (11)

PASS FAIL

SUBTEST EIGHT

Practice Story:

- I. 1. a (b) c d
2. a b c (d)
3. (a) b c d
4. a b c (d)
5. a b (c) d

Test Stories:

- I. 1. (a) b c d
2. (a) b c d
3. a b c (d)
4. a b (c) d
5. a (b) c d
II. 6. a b (c) d
7. a (b) c d
8. a (b) c d
9. a b (c) d
10. a (b) c d

(Turn Book Over)

- III. 11. a b (c) d
12. a b c (d)
13. (a) b c d
14. a (b) c d
15. (a) b c d

No. Correct _____ (11)

PASS FAIL

SUBTEST NINE

Practice Stories:

- I. 1. a (b) c d
2. a b c (d)
3. (a) b c d
II. 4. (a) b c d
5. a b c (d)
6. a (b) c d

Test Stories:

- I. 1. a b c (d)
2. (a) b c d
3. a (b) c d
II. 4. (a) b c d
5. a b c (d)
6. a b (c) d
III. 7. a b (c) d
8. a b c (d)
9. (a) b c d

No. Correct _____ (6)

PASS FAIL

Time Tested Ended _____

SUBTEST TEN

Practice Story:

- I. 1. (a) b c d
2. a (b) c d
3. a b c (d)
4. a (b) c d
5. a (b) c d

Test Stories:

- I. 1. a (b) c d
2. a b (c) d
3. a b c (d)
4. (a) b c d
5. a (b) c d
II. 6. a b (c) d
7. a b c (d)
8. a (b) c d
9. a b c (d)
10. a b (c) d

No. Correct _____ (7)

PASS FAIL

TAC TEST DATE	BY	TAC SCORE	AGE	PTA (Better Ear)	HEARING TEST DATE	AMPLIFICATION WORN	COMMENTS

SUBTEST

100	1	2	3	4	5	6	7	8	9	10	100%
90.	73.	73.	95.	93.	93.	73.	93.	89.	90.		
	87.	87.	90.	87.	87.	87.	87.				
	80.	80.	85.	80.	80.	80.	80.	78.	80.		
			80.	73.	73.	67.	50.				
80.	73.	73.	75.	70.	67.	60.	73.	73.	67.	70.	
			65.	67.	60.	53.	67.	67.			
	67.	67.	60.	53.	47.	67.	67.	56.	60.		
70.	60.	60.	55.	40.	40.	60.	60.				

No. _____

Name _____

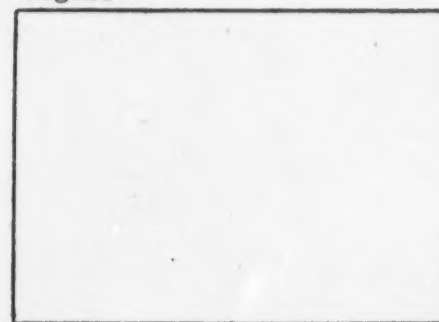
Birthdate _____

School _____

Class _____

PASSING PERFORMANCE

Legend



ATTACHMENT E

TAC PROFILE SHEET

SPEECH VS NOISE

SP VS. NON-SP VS NOISE

FAMILIAR PHRASES

NOUN VOCABULARY

TWO CRITICAL ELE.

FOUR CRITICAL ELE.

SIMPLE STORIES-QUIET

COMPLEX STORIES-QUIET

SIMPLE STORIES- C.M.

COMPLEX STORIES- C.M.

APPENDIX F

TAC PLACEMENT INFORMATION

Audiologist: _____ School/District _____

Address: _____

In addition to the information requested for each individual student on the TAC response forms, please complete the following and return with response forms.

A. What alternative class settings are available for hearing-impaired children in your district? (please indicate by ✓)

- _____ Residential School for the Deaf (____ Public, ____ Private)
- _____ Day School for the Deaf (____ Public, ____ Private)
- _____ Full time classes for the Hearing-Impaired (special self-contained classrooms)
- _____ Regular classes part-time/Special classes part-time
- _____ Itinerant Programs
- _____ Pre-school Programs
- _____ Other: _____

B. In your Program(s) what mode(s) of communication are utilized in the education of students?

- _____ Oral communication
- _____ Manual communication
- _____ Total communication
- _____ Other: _____

C. How are educational placement decisions made for hearing-impaired students in your area?

- (1) Referral by: _____
- (2) Decision personnel: _____

- (3) Basis of decision: _____

- (4) Decision Reviews? _____

D. For each student tested, indicate on the TAC response form under "Comments":

- (1) Do you feel placement for this child is appropriate (Yes, No)
- (2) If no, what would be the ideal placement (Regardless of availability of program).

PRESENTATIONS

10/16/76	California Speech and Hearing Association District Fall Conference Los Angeles, California	Overview of the Auditory Skills Instructional Planning System
10/26/76	Southern California Administrators of Programs for the Deaf and Hard of Hearing Los Angeles County Education Center Downey, California	Overview of the Auditory Skills Instructional Planning System
11/22/76	American Speech and Hearing Association Annual Convention Houston, Texas	"Auditory Skills Instructional Planning System - A Preliminary Field Study"
11/22/76	American Speech and Hearing Association Annual Convention Houston, Texas	"Auditory Skills Instructional Planning System - The Test of Auditory Comprehension"
3/19/77	California Association of Teachers of the Hearing-Impaired Los Angeles, California	Implementation of the Auditory Skills Curriculum at Southwest School for the Hearing-Impaired
4/26/77	California State University Fresno, California	Development and Implementation of the Auditory Skills Instructional Planning System
6/29/77	Conference of American Instructors of the Deaf Los Angeles, California	Auditory Skills Instructional Planning System - Instructional Media Workshop
7/8/77	Academy of Rehabilitative Audiology Champaign/Urbana, Illinois	Development and Implementation of the Auditory Skills Instructional Planning System
7/28/77	Request for Proposals (RFP), Publisher's Bidding Conference Downey, California	Formal Presentation and Exhibition of the Auditory Skills Instructional Planning System
<u>EXHIBITS</u>		
11/20 - 11/23/76	American Speech and Hearing Association Annual Convention Houston, Texas	Scientific Exhibit - Auditory Skills Instructional Planning System - Second Award for Excellence of Presentation
6/29 - 6/30/77	Conference of American Instructors of the Deaf Los Angeles, California	Scientific Exhibit - Auditory Skills Instructional Planning System

EVALUATION OF THE TEST OF AUDITORY COMPREHENSION

Average ratings for 24 respondents

The following items were rated on a numbered scale from 1 to 5 where:

- [5] - Extremely valuable/Excellent
- [4] - More than adequate/Very Good
- [3] - Adequate/Average
- [2] - Less than adequate/Fair
- [1] - Little or no value/Poor

A. TAC CONTENT/DESIGN

1. Usefulness of the TAC ----- [4.3]
 - measure of auditory functioning [4.3]
 - measure of specific abilities [4.4]
 - measure of potential [3.6]
 - aid for educational placement [4.3]
 - guide for auditory training object's. [4.5]
 - aid in classroom strategies [4.5]
 - measure of progress [4.3]
2. Value of TAC for audiologists ----- [4.1]
 - in school situations [4.7]
 - in clinical situations [3.7]
 - in other settings [3.8]
3. Usefulness for discussions/planning --- [4.3]
 - with teachers of hearing impaired [4.6]
 - with regular school teachers [4.1]
 - with administrators/supervisors [3.9]
 - with parents of hearing impaired [4.4]
 - with speech/language specialists [4.3]
4. Usefulness/Appropriateness to pupils -- [4.2]

- moderate loss	[4.5]	Age 5	[3.5]
- mod/sev. loss	[4.6]	Age 5-6	[4.2]
- severe loss	[4.3]	Age 7-9	[4.5]
- profound loss	[4.1]	Age 10-12	[4.3]
5. Facility of the TAC ----- [4.4]
 - ease instructing pupil [4.6]
 - ease interpreting results [4.1]
 - ease administering TAC [4.5]

B. TAC COMPONENTS

- 6. TAC Manual ----- [4.5]
 - Clarity of administration/scoring procedures [4.4]
 - Completeness of test description/development [4.6]
- 7. TAC Cassette Tape ----- [4.5]
 - Quality of speech stimuli [4.1]
 - Quality of non-speech stimuli [4.3]
 - Calibration signal, type/length [4.2]
 - Stop-pulsing and remote control [4.4]
- 8. TAC Test Books I & II --- [3.9]
 - Design of books, size/layout [4.0]
 - Clarity of graphics [3.8]
 - Ease of handling [3.8]
- 9. Response Forms/Scoring Procedures ----- [4.3]
 - Choice of pointing response mode [4.6]
 - Response form identification data [4.3]
 - Answer sheets, layout/design [4.2]
 - Ease of recording responses [4.2]
 - Ease of computing the TAC score [4.2]
 - Design of Profile Sheets [4.2]
 - Usefulness of Profile Sheets [4.5]

D. FUTURE USE OF THE TAC - Number of respondents = 24

- 24 - would purchase the TAC if available separately
- 21 - would purchase the complete ASIPS package
- 19 - would use the TAC routinely as part of their standard test battery
- 20 - would prefer the TAC on cassette tape
- 4 - would prefer the TAC on reel-to-reel

Other populations for which the TAC may be of value:

- 18 Multiply handicapped hearing impaired
- 9 Hearing impaired younger than 4 years
- 18 Hearing impaired older than 12 years
- 13 Hearing loss less than 41dB (mild losses)
- 11 Trainable Mentally Retarded
- 17 Educationally Handicapped
- 19 Severe Language Disorders/Aphasia
- 9 Remedial Speech
- 3 Learning Disabilities/ Auditory Processing problems

Other professionals who could administer the TAC:

- 12 Teachers of hearing-impaired
- 11 Speech/Language specialists

TEST OF AUDITORY COMPREHENSION - SUBTEST EVALUATION

Please rate each of the subtests of the TAC for (a) overall design, (b) content/quality of the auditory stimuli (test items), (c) specific prescriptive/diagnostic value, and (d) any specific comments you might have.

[5]- Excellent [4]- Very good [3]- Adequate/Average [2]- Only fair [1]- Poor

SUBTEST	DESCRIPTION	DESIGN	TEST ITEMS	VALUE	OVERALL
ONE	Recognizes speech vs. non-speech Male, female voice, horn, drum 10 test items, 2 alternatives	4.0	4.3	4.4	4.2
TWO	Discriminates among speech phrases, human non-speech, and environmental sounds 15 test items, 3 alternatives	4.5	4.4	4.4	4.5
THREE	Discriminates familiar speech phrases, male, female, child voices 15 test items, 3 alternatives	4.3	4.2	4.3	4.3
FOUR	Comprehends one critical element - core noun vocabulary 20 test items, 4 alternatives	4.4	4.5	4.3	4.4
FIVE	Comprehends two critical elements including nouns, adjectives, verbs, prepositions 15 test items, 4 alternatives	4.6	4.5	4.5	4.5
SIX	Comprehends four critical elements, recalls- sequences four words 15 test items, 5 alternatives	4.4	4.4	4.5	4.4
SEVEN	Comprehends a simple story; recalls, sequences three events 15 test items, 4 alternatives	4.4	4.4	4.5	4.5
EIGHT	Comprehends a complex story; recalls five details from context 15 test items, 4 alternatives	4.5	4.5	4.4	4.6
NINE	Comprehends a simple story in the presence of competing speech messages 9 test items, 4 alternatives	4.3	4.1	4.3	4.2
TEN	Comprehends a complex story in the presence of competing speech messages 10 test items, 4 alternatives	4.4	4.3	4.2	4.3

AVERAGES

4.4

4.4

4.4

EVALUATION OF THE TEST OF AUDITORY COMPREHENSION

GENERAL COMMENTS:

The TAC was invaluable in determining auditory objectives within ASIPS. As a measure of progress and helping in the determination of class placement no other other instrument has been as much help as the TAC. (01)

Value of the TAC is to provide concerned school personnel with an in-depth evaluation of the student's auditory comprehension and specific procedures for remediation. (05)

It would be extremely valuable for screening the children for appropriate class placement and for designing an appropriate auditory training program. Its use as an annual progress test could be extremely valuable to determine the child's progress. If no progress, and investigation as to why could follow. (06)

This test is one of the most objective tools that I have used in the evaluation of listening skills directed towards a specific goal for the development of auditory training materials with students. When the "follow up" materials are available to the teachers, then the TAC will be a total tool in the educational process.

A great tool for both initial evaluations of listening skills, some hearing aid evaluation input, and a direct input to specific auditory training activities. (08)

Easy to administer and quick-assessment of child's auditory functioning level (12)*

Congratulations on your efforts - I feel this is a valuable tool and am anxious to utilize it on a larger scale with our special education population. (12)*

It appears to be an innovative approach to clinical and educational evaluation of hearing impaired children. (16)*

Anticipated value: as a baseline measure of listening skills with periodic review of progress; as an indicator of level that should receive specific attention at home, in class, and in therapy. (17)

I am quite pleased with the TAC and I foresee many practice uses for the test in our school. In addition to its use as a tool for placing the children on the curriculum, I feel it should be administered routinely as part of our audiological test battery. It provides quantitative information regarding a child's current level of performance plus it can be used to objectively monitor a child's progress in the development of specific auditory skills. The fact that the test taps a child's comprehension of spoken language further extends the usefulness of the procedure. (18)

In general, I'm very pleased with the TAC and foresee the widespread use of it in our school. I think it is important to point out that most of my comments about the TAC are based on my experiences using the test with our population (which primarily consists of children with profound hearing losses). Some of the problems we encountered may be unique to a population such as ours and may not reflect weaknesses in a test that was designed for use with a wide range of hearing impaired children. (18)

General Comments, Continued

Thank you for letting us participate. Your hard work is evident throughout (13)

The TAC test should (actually must) be accompanied by a thorough case history. Test scores here appeared to be highly related to past experiences and auditory training. I'm glad to see this type of test being developed! (15)

I have been impressed with what I have seen of the TAC and feel it is far superior to anything else currently available to teachers. (20)

Auditory training & skills assessment has been neglected for too long. This should be a valuable tool. (21)

The value of TAC is more obvious as the administrator became more versed in giving it. I believe the profile it provided of individual ability one of its greatest assets. One of our greatest needs is to supply teachers with auditory training tasks appropriate for individuals or groups of children with similar abilities - This Test and hopefully the material that will result from it should be a most useful tool. (23)

I found the TAC to fill a very large gap in our pediatric test battery. Although in some instances, results brought on issues for contention with classroom teachers, at least a more reasonable framework was available for discussion purposes. (24)

TAC EVALUATORS

No.	Name	Title/Position	School/District
01	Rick Witlen	Educational Audiologist	Los Angeles County Schools, CA
05	William G. Ritchie	Audiologist	Alhambra Unified School District, CA
06	Douglas Richards	Educational Audiologist	Santa Ana Unified School District, CA
08	Gene Renck	Audiologist	Centralia Unified School District, CA
12	Nancy L. Brixey	Audiologist	Mt. Diablo Unified School District, CA
13	Joan Nassberg	Sr. Educational Audiologist	Los Angeles City Schools, CA
15	Jan Colton, Ph.D.	Post Doctoral Fellow	Univ. of Illinois, Champaign-Urbana
16	John O'Neill, Ph.D.	Head, Dept. of Speech & Hearing Science	Univ. of Illinois, Champaign-Urbana
17	Helen Gladwin	Audiologist	Hillsborough County Schools, Tampa FL
18	Mary Joe Osberger	Audiologist	Lexington School for the Deaf, NY
20	Karen Jensen	Supervisor, Education of the Deaf	Cal. State University, Fresno, CA
21	Diane Mabry	Audiologist	Los Angeles City Schools, CA
23	Helen Fulton	Audiologist	A.G. Bell, Columbus Public Schools, OH
24	Derek Sanders, Ph.D.	Professor	State Univ. of New York, Buffalo, NY